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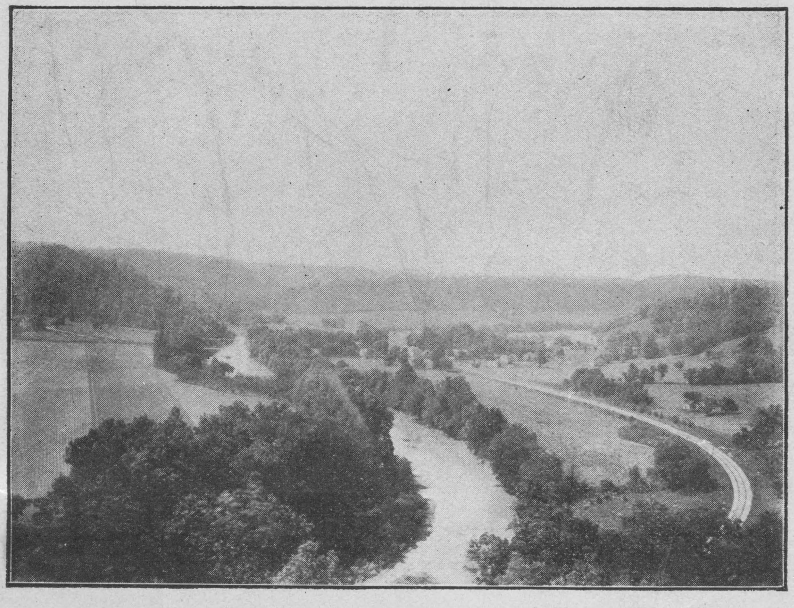
The Agricultural College Extension Bulletin

LIFE OF A MOTH

F. M. WEBSTER
Formerly of the Ohio Agricultural Experiment Station

PLANTING ON RURAL SCHOOL GROUNDS

A. B. GRAHAM
Superintendent Agricultural Extension



No tears
Dim the sweet look that nature wears.
—*Longfellow.*

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OHIO STATE UNIVERSITY

A Suggestion for School Ground Planting.

Great torpid grapes, all fattened through
With moon and sunshine, shade and dew.
—*Riley.*

OLD OCTOBER.

Old October's purt' nigh gone,
And the frost a comin' on
Little heavier every day—
Like our hearts is that away!
Leaves is changin' overhead
Back from green to gray and red,
Brown and yeller, with their stems
Loosenin' on the oaks and e'ms;
And the balance of the trees
Gettin' balder every breeze—
Like the heads we're scratchin' on!
Old October purt' nigh gone.

I love old October so,
I can't bear to see her go—
Seems to me like loosin' some
Old-home relative er chum—
'Pears like sorte' settin' by
Some old friend 'at sigh by sigh
Was a-passin' out o' sight
Into everlastin' night!
Hickernuts a feller hears
Rattlin' down is more like tears
Droppin' on the leaves below—
I love old October so.

THE STORY OF THE LIFE OF A MOTH.

By F. M. Webster,

Formerly of the Ohio Agricultural Experiment Station.

There is probably nothing that so interests children, or excites their curiosity more than beautifully colored insects. And nothing would contribute more to excite their natural inquisitiveness than these insects, provided there were any persons able to give them satisfactory answers to their questions. The stereotyped reply, "They're only just bugs," gets dry and monotonous, even to children, and these little ones who are thus forced to accept this answer soon come to misapply it in the same way and there the matter usually rests.

Recent efforts have been made to institute what are termed "Nature Studies" in the public schools—a very laudable movement,—but who is to give the instruction? In a majority of cases the teacher has yet to be taught, and, besides they are often confronted with the question, "Where shall I go to find out what I am to teach?" and the answer has in many cases not yet been given.

In many foreign countries the youngest pupils in the schools are taught to observe the common insects, and instruction is given by the teachers as a part of their duty and generally either by illustration or by word of mouth. Besides this there are often published short stories or anecdotes tending to encourage an interest in such studies, so that when these children grew up to manhood or womanhood, no matter how humble their lives may be, they do not forget the simple lessons taught in the school-room, but have a fixed, general idea of the things around them, which knowledge they have obtained in a most pleasing manner and almost without knowing it.

All men are not husbandmen and all children do not, and of course cannot, live in the country, but, except in the overcrowded portions of our larger cities, there are few people who are denied the garden or lawn, even though these may be limited in area, and with them are always to be found insects of various kinds. With neither garden nor lawn, there are still trees and plants and flowers in the parks, and these have their insect inhabitants, both good and bad.

Now, it would seem that if we could put into the hands of the

young, and especially the school children, some short, simple, illustrated story of the lives of some of the most common and most easily seen of these insects, we would be doing for the children just what the Experiment Station has been trying to do for grown people; and if we can but instill into their juvenile minds a love for nature, it will tend to make them better men and women, whether they, later on in life, abide in the city or country. In the following pages, then, it will be the aim to present in the most simple form possible, the stories of the lives of one each of our largest and most common butterflies and moths. These have been selected on account of the very fact that they are common, and being highly colored are easily seen. However, the fact must be borne in mind that this bulletin, while intended more especially for the young, may also prove of interest to those who are older yet not familiar with insects, and to whom the more scientific bulletins are not especially interesting. Besides this, both of these insects are classed among the injurious.

The Cecropia Emperor Moth.

Of the many beautiful insects that are to be found in this country there are very few which excite more surprise and delight than the big Ce-cro-pia Em-per-or Moth, a picture of which is here given about natural size, as it measures, when its wings are spread, from five to seven inches from tip to tip. Its wings are mostly of a rich brown color, the front pair being grayish, shaded with red, the hind pair more brown, and about the middle of each wing is a spot of the shape shown in the picture, white, shaded more or less with red, with the edges black. A wavy, dull red band, edged on the inside with white, crosses each of the wings.

The outer edges of the wings are pale, silky brown on which, on the front pair, runs a wavy dull black line, and on the hind wings, instead of this line is a double broken band of the same color. The upper side of the body and the legs are dull red and there is a wide band behind the head and the hinder edges of rings of the body are white and the under side of the body is also marked with white.

These moths may sometimes be noticed in late May or early June, clinging to the underside of a leaf of a tree or shrub, and upon this fastening small, dull, creamy white eggs, about one-tenth of an inch long, almost round, with a reddish spot or streak near the middle.

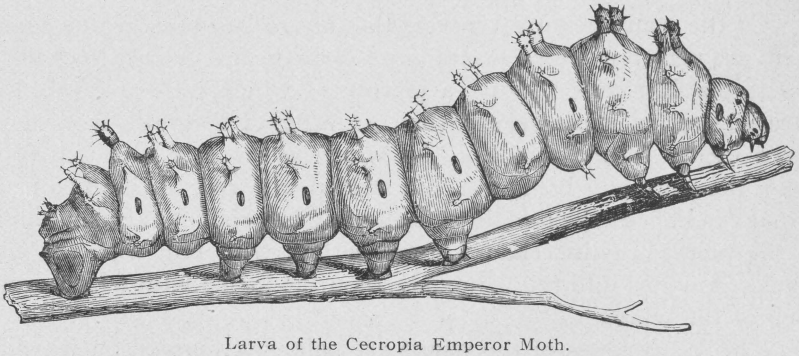
As the mother moth has to lay from two to three hundred of these eggs, which she generally places in pairs, it takes her quite a long while to finish her work.

In a week or ten days a young caterpillar eats its way out of the egg and then eats the empty shell. It is black at first, with little, shining black knobs on its body, and from out of each knob grows a black hair.

As with the butterfly, this black coat soon begins to get too small for the young caterpillar, and it must get a new one, which simply grows over it underneath the old one, which bursts and the caterpillar comes out in an entirely new suit.

This time the body is of a deep orange color, and the black knobs now look more like warts, but they are still black like the head and there are rows of black dots along the body between them.

But this suit is soon out-grown and cast away, the next one being of a beautiful yellowish tint, and the little knobs become immense, spiny warts as shown in the picture below, which shows the full-grown caterpillar about natural size.

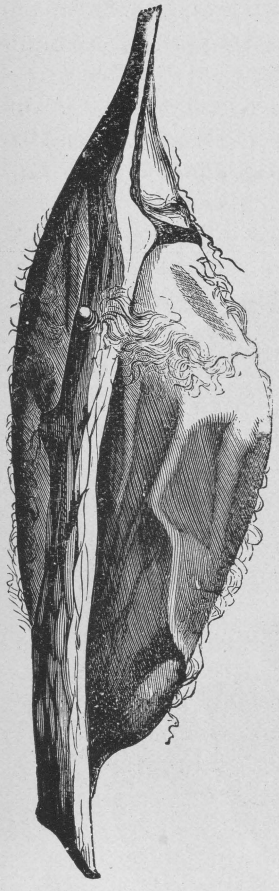


Larva of the Cecropia Emperor Moth.

The very large warts on the back are colored blue, coral red and yellow, with black spines and a black spot on the inside and outside of the stem on rings 4-11; those on the sides are blue and the head is of the same color as the body.

This caterpillar does not breathe through the head, but through the small holes in the body along the side; these are shown in the picture between the warts along the sides, except on the second, third and last rings.

But there is another changing of coats, and this time the head and



Cocoon of the
Cecropia Emperor Moth.

body are delicate bluish green, and the black spots disappear, except those below the row of warts farthest down on the side.

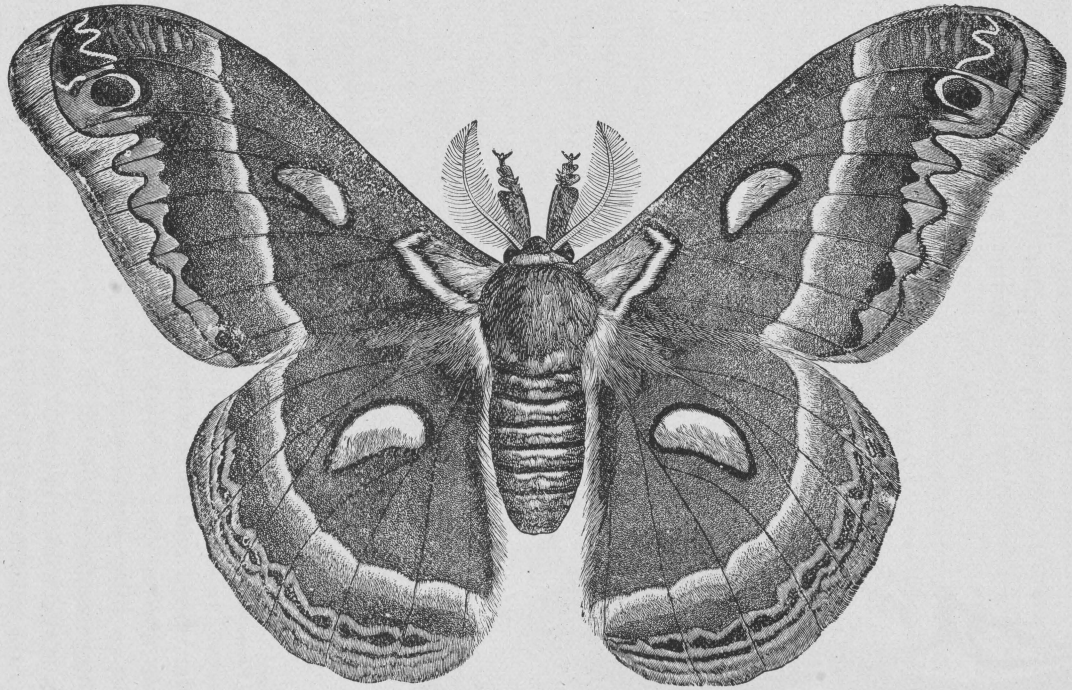
But there is one more change of coats, and then the caterpillar is exactly of the shape shown in the picture, measuring usually over four inches in length, and the red warts near the head have very often changed to yellow.

While this caterpillar has been growing and changing its dress it has eaten a great many leaves of whatever kind of tree it may have been on, and it will eat apple, cherry, plum, pear, willow, lilac, currant, hazel, hickory, birch, elm, honey-locust, barberry, hawthorn and elder. In a single day it may eat more than its own weight of food.

But as in the case of the butterfly all of the growing takes place in the caterpillar stage and butterflies and moths never get any larger than when they first appear.

This large, ugly-looking caterpillar now ceases to feed and crawls to the limb of a tree, or sometimes a post, and with its mouth and material therefrom, it begins to weave a silky covering almost like paper. This is much too large for the body of the caterpillar, but just beneath this outer covering it spins a great number of loose threads almost as soft as cotton, and still inside of this is a much smaller, very closely woven case, smooth and shiny on the inside. Boys and girls with sharp eyes may sometimes see the caterpillar making this covering which is fastened lengthwise to a limb, post or other object while being made and is called a co-coon, and is shown in the picture about its natural size and shape.

This is the winter home of the insect, for these moths are different from the swallow-tail butterfly in that there is only one brood of young each year. About two weeks after this co-coon is finished, the caterpillar that made it changes to a large, brown chrys-a-lis, and

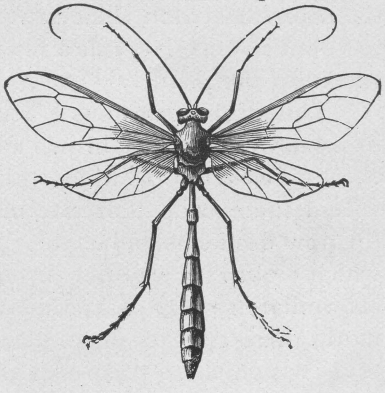


Cecropia Emperor Moth.

in this shape and stage the insect passes the winter. Its winter home, like our houses, has an outer and inner wall, and these walls being tough serve to protect the helpless insect from many of its enemies, but not all of them. In the winter time, when the ground is covered with snow, the hairy wood-pecker gets very hungry and it finds out that there is something inside the co-coon that is good to eat. So it will creep out along a limb, and with its sharp bill or beak, make a hole through both walls of the co-coon and drink the blood of the chrys-a-lis within.

If nothing happens to this big, brown chrys-a-lis in its winter home, a big Emperor moth will grow within the chrys-a-lis, and in late May or early June will be ready to make its way out. But how is it to get out? If these big co-coons are gathered in late fall or winter and kept in a warm room the moths will come forth long before warm weather, but if the co-coons are examined very closely they will seem to be as perfect as when first brought in, but the big moth is not now on the inside, but crawling or flying about the room and the two wonders are, how so much moth could stay in such a small house, and how it could get out.

The great ugly caterpillar, when it made the co-coon, seemed to know that as a moth it would have to get out, and therefore left a door, but where is the door? If an empty co-coon is cut open lengthwise with a pair of sharp scissors, it will be found that what was the upper end of the co-coon when it was made, was very loosely spun, and the caterpillar, just before it was turned to the chrysalis, placed its head at this end of the co-coon, and when the big moth is ready to make its way out, it moistens these loose threads and pushes its way out from among them, and into the outside world.

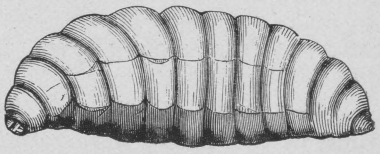


Ichneumon

We have stated that the only time in the whole life of the insect, during which it grew, was while it was a caterpillar, and that butterflies and moths do not grow. This does not mean that they do not eat though their mouths are very different from those of caterpillars, as these last have jaws and can gnaw leaves; but the mouth of a moth or butterfly is only a very long, slender tube, fast-

ened beneath the head, and is coiled up just like the spring of a watch, and can only be used for sipping the nectar from flowers. Some butterflies can be caught and fed upon sweetened water, which they will sip by unwinding their long, thread-like tube, when their eating can easily be watched. Like the caterpillars, they breathe through tiny holes or slits in the sides of the body. So, while they have mouths, they do not have noses. Butterflies and moths all belong to the Lepidoptera, meaning that their wings are more or less covered with scales placed like those of a fish.

A great many of the caterpillars are probably eaten by birds, but there is another enemy, in the form of a wasp-like insect, shown about natural size in the picture. This carries underneath its body a sharp, pointed, slender, needle-like tube, looking somewhat like the sting of a bee but which is really used for laying its eggs in the bodies of caterpillars. This wasp-like insect will creep up to a large caterpillar and, while standing with its face towards it, raise itself slightly on its feet and bending the slender hinder part of its body forward beneath the front portion, it quickly thrusts the needle-like tube into the body of the caterpillar, leaving a tiny egg just under the skin. This egg hatches out a little white grub, which feeds upon the flesh of the caterpillar, being careful not to touch any vital parts so as to kill it. In this way it continues to live and grow within the body of the caterpillar until the latter has made its winter home; when, instead of turning to a chrysalis, it dies, while the little white grub makes his way out, leaving nothing but the empty skin of the poor caterpillar. The grub has no feet, but is very large and fat as it is shown in the picture.



Grub of Ichneumon
Sometimes found with the cocoon of the Emperor Moth.

This grub now spins a cocoon of its own, which is dark brown and very closely woven. Within this, and within the cocoon that was made by the now dead caterpillar, this fat grub changes to the wasp-like insect, which makes its way out through the same door that was left by the caterpillar, so that sometimes, instead of getting a large, beautiful moth, there appears in its place one of these wasp-like insects.

Though these wasp-like insects seem to live in a very cruel way, they destroy a great many caterpillars, which would otherwise prob-

ably do a great deal of injury to trees by eating the leaves, so these last named insects are friends instead of foes, and on account of their habits are called parasites.

FIELD TRIPS.

"Hast thou named all the birds without a gun?"
—*Emerson.*

When we take our trips along the roadside, to the woods, the field, or just out into the school ground, there we feel that we have accomplished more if we have been able to recognize our friends, the plants and insects, and call them by name.

Space will not permit illustration or description for all the plants or insects that we may be able to find until the weather has become too cold for them. However, one of the common fall moths has been presented. Others will follow in the November issue.

The poorest work done under the name of "Nature Study" is that in which we become the slave of the book or nature study leaflet. Books and leaflets to assist us in our work are necessary. Let them help us to identify and assist us in studying the behavior of plants and animals.

One whose power to observe has been cultivated is worth more to himself and to others than a thousand nature study "bookworms."

Take the children out into the school yard, along the roadside to the woods, or along the creek if not too far away. It isn't necessary to go where children will get their feet wet.

Larvae (commonly called ugly worms), as harmless as they are, do not need to be handled. Break off the leaf or branch on which you find them and put them in a glass can or box. Their repulsive odor, their striking, wiggling and spasmodic jerks amount to nothing. They won't harm you. They make great pretenses.

We have instinctive fear which accounts for our disliking to handle them. Don't say to the child that these larvae (green worms) sting or bite. Teaching children that Dragon flies (sometimes called snake feeders or snake doctors) and Locusts (properly called Cicadae) will sting people is pretty thin instruction born of ignorance. When you find either of these with stings, such as bees and wasps have, we would be glad to have you send it to us.

The Department of Agricultural Extension will be glad to name the common wild plants and insects, if they are carefully packed and mailed.

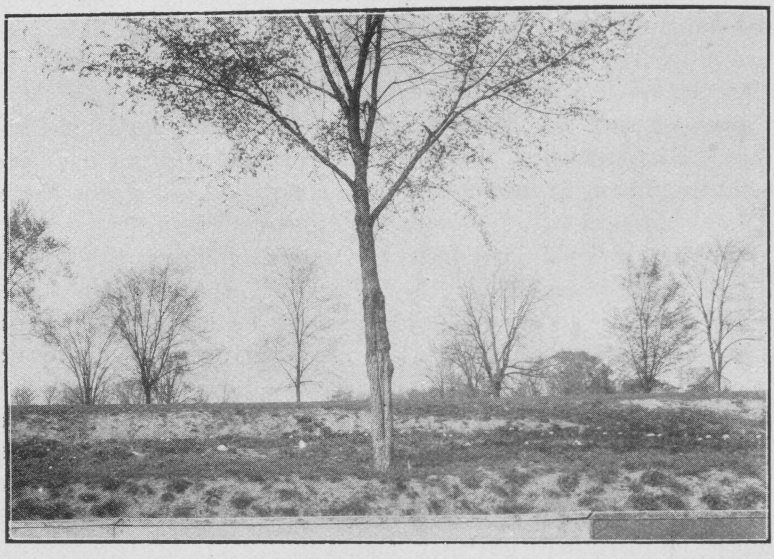
Books.

HELPS.

Every one needs the assistance of books in any particular work. We have aimed to name below one book in each subject for fall and spring work.

For identifying wild flowers:

"Field Book of American Wild Flowers," by F. Schuyler Mathews, published by G. P. Putnam's Sons, New York. Price $1.75.



School Ground Elms.

Heaven and earth help him who plants a tree,
And his work his own reward shall be.
—*Lucy Larcom.*

It is about 4 in. by 6 in., 550 pages, and contains many colored plates. On the left page is a simple description and on the right is the illustration of the flower described. This book is of convenient pocket size.

For identifying common birds:

"Field Book of Wild Birds and Their Music," by F. Schuyler Mathews, published by G. P. Putnam's Sons, New York. Price $2.00. It is the size of his "American Wild Flowers." About 40 colored plates.

For identifying moths and butterflies:

"Moths and Butterflies," by Mary C. Dickerson, published by

Ginn & Co., Columbus, Ohio. Price $1.25. The illustrations are from photographs made from life.

For general work:

Kelley's "Short Stories of Shy Neighbors," published by the American Book Company, Cincinnati, Ohio. Price $0.50; or Hodge's "Nature Study," published by Ginn & Co., Columbus, Ohio. Price $1.80.

Free Bulletins.

There are free bulletins printed by the Agricultural Department, Washington, D. C. A postal card will bring one or as many as you think you need, selected from the following list:

No. 28 Weeds, and How to Kill Them.
54 Some Common Birds.
77 The Liming of Soils.
86 Thirty Poisonous Plants.
134. Tree Planting on Rural School Grounds.
155 How Insects Effect Health in Rural Districts.
171 Control of Codling Moth.
185 Beautifying the Home Grounds.
195 Annual Flowering Plants.
196 Usefulness of the American Toad.

These free bulletins are well illustrated.

Could you not begin a file of these publications for your High School library?

FALL PLANTING ON SCHOOL GROUNDS.

A. B. GRAHAM, Superintendent Agricultural Extension.

Why should not the school ground be made one of the beautiful places in the school district? Here the children spend more of their wakeful hours during the school term than at home. These hours of study or play mean much more when the surroundings are conducive to putting forth the best efforts.

The green leaves of the spring, the colored foliage of the fall, the sumac, asters, and golden-rod all add something towards creating a more cheerful spirit.

The fact that great men and women have attended school in a tumbled down school house situated among unfavorable surroundings argues nothing. It was not the condition that made them great; they would, no doubt, have become great in spite of conditions.

This is a day of popular education. Every condition that will be most favorable to all should be provided if within means. In most cases those things which have most real beauty to commend them can be acquired with least pecuniary expense. What does it cost to plant a tree or a shrub? How expensive is it to set out a flower? Very little time need be taken to clean up a school yard if there are willing hands. Every boy and girl can be made willing to help; there are always patrons who are ready to assist if they know what you want done.

The diagram shows the planting on a country school ground in western Ohio. Observe that the bush roses, japonica, or flowering quince, snowballs, sweet clove, bridal wreath, etc., are set in masses in the corners and near the sides that the playground might not be encroached upon. Those which do not grow very high were set in front. The hardy hydrangia and trumpet vine are suitable for spring planting; they should be on every school ground. Near the front porch are planted crimson ramblers. Near the fences have been

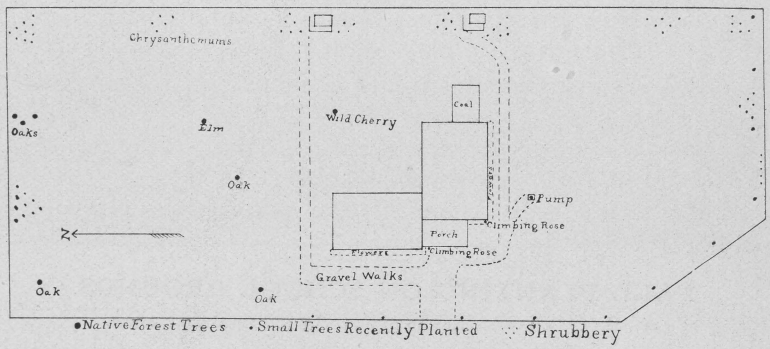


Diagram Showing Plantings in Next Illustration.

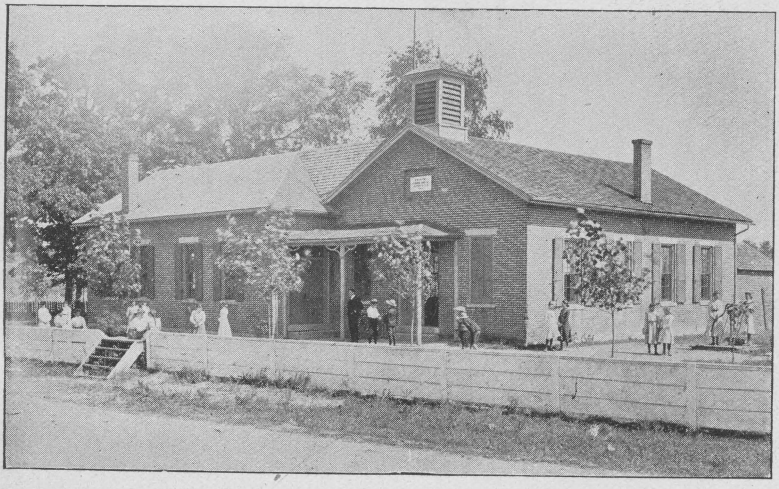
planted hardy chrysanthemums which were brought in from the overcrowded bed in some yard. To hide the foundation several hundred tulips and hyacinths of different colors were used. Crocuses were peeping through the green sod in the early spring. Al that is necessary to do work of this kind is to arouse a little interest among the children and the patrons. The children should be permitted to do a part of the work because it is a joy to a child to know that he assisted in doing a good work. There is a spirit in both old and young boys and girls that likes to say quietly, "I helped."

In preparing a bed for the tulips spoken of it was necessary to dig a trench in the hard gravel along the end and one side of the house.

It was about a foot wide and eight or ten inches deep. Who did the work? The teacher and the children, with an old pick and spade. Black dirt was hauled from a woods and the trenches filled. Along each trench strips of sod eight or ten inches wide were laid, making a pretty green border.

In early November the tulip and hyacinth bulbs were planted six inches deep and about three or four inches apart. They might have been planted eight or ten inches deep if the dirt had been loose. After blooming the tulips could be cut off and geraniums or coleus for the summer could be planted in the same ground. After frost tulips and hyacinths should remain in the ground over winter to be ready for spring blooming.

Remember that tulip, hyacinth, daffodil, narcissus and crocus bulbs must be planted in October and November. Crocuses should be only about three inches deep. They seem to be much prettier if a variety of colors are selected and the planting irregular.



A Well Planted Ground in Western Ohio.

I think that no man does anything more visibly useful to posterity than he who plants a tree.
—*Lowell.*

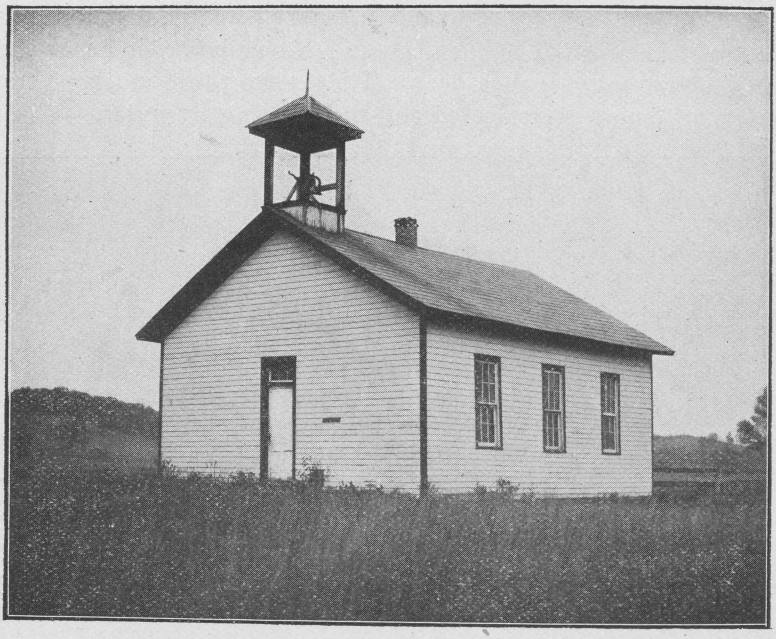
Are fences necessary to protect plants? Not at all. Public sentiment will protect a flower if the public through its children helped in the planting. Yes, there is an exceptional indifferent one now and then, but the public that has a beautiful school ground and has exper-

ienced a new feeling because of it will take care of the indifferent ones. Keep planting. Agitate. But don't agitate without work. Accept a suggestion from a patron or a child as to designs or work or methods of raising funds.

HELP US TO HELP OTHERS.

Any rural school teacher having a well-planted ground or beautifully decorated room, or a good library will help very much to suggest an improvement to others by sending us a good photograph showing these improvements.

Superintendents working in centralized schools can render much assistance by sending this department photographs showing the buildings, wagons, heaters, etc., and maps showing routes. Teachers in consolidated schools can do quite as much by maps of routes and photographs. Nothing tells us more in a small space than a picture.



What An Opportunity!

Waiting for the man with—a spade and a tree.

We know this department cannot serve the teacher and school board member as it should without your help.

FOR FALL PLANTING.

Herbaceous Plants for Spring Blooming.

Common poenies (pinies).....Bloom in May and June.
Narcissus, Daffodil and Jonquil, 6 in. deep.....Bloom in April and May.
Tulips, 6 in. to 8 in. deep.....Bloom in April and May.
Crocuses, 3 in. to 4 in. deep...Bloom in March and April.

(Herbaceous Plants, for fall blooming, should be set out in the spring.)

Flowering Trees and Shrubs.

Dogwood .....Blooms in May; color white.
Snowdrop .....Blooms in April and May; color white.
Flowering Almond.....Blooms in early May; color rose.
Japanese Quince (Japonica)..Blooms in April and May; color scarlet.
Bridal Wreath.....Blooms in May; color white.
Lilac .....Blooms in May; color white and purple.
Honeysuckle .....Blooms in June; color white and pink.
Smoke Tree.....Blooms in June, July; reddish purple.
Syringia, or Mock Orange....Blooms in June; color white.
Snowball .....Blooms in May; color white.
Rose of Sharon.....Blooms in September and October; color white and rose.
Black Alder.....Fruits from October to February; color scarlet.
Yellow Willow.....Color of stems, November to April, yellow.

The maples and elms are among the best native trees for the school grounds. The Carolina poplar compares about as favorably with our native Ohio trees as the English sparrow with our native birds.

Why not plant a walnut or an ash? Would not an apple tree the fruit of which would ripen in the fall, or a grape vine be suitable for a school ground planting?

PRICES OF BULBS FOR FALL PLANTING.

Hyacinths (mixed colors), $3.50 per 100, or 3½ cents apiece.

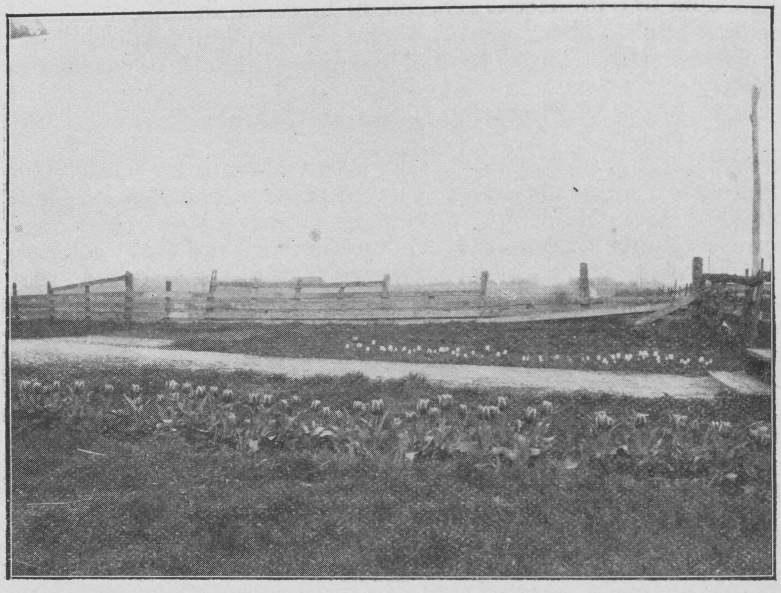
Tulips (mixed colors), $1.00 per 100, or 1 cent apiece.

Daffodils, Narcissus and Jonquils (double or single), $2.00 per 100, or 2 cents apiece.

Crocuses, 35 cents per 100.

If a mixed lot, say 8 hyacinths, 25 tulips, etc., is chosen, the total should not be less than one dollar's worth.

The bulbs can be obtained from Good & Reese, florists, Springfield, Ohio, or from the Livingston Seed Company, Columbus, Ohio, at these prices. Doubtless other florists will furnish them at the same prices. Expressage or postage **not** prepaid.



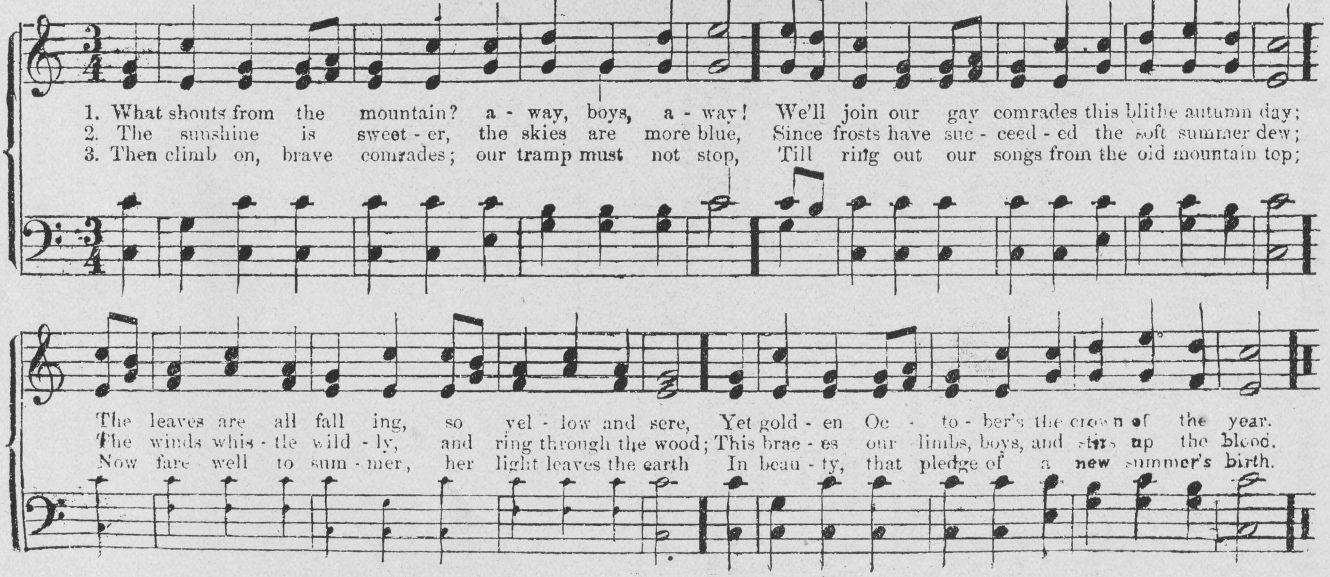
From the Stile to the Schoolhouse Step.

PLANS FOR PLANTING SCHOOL GROUNDS.

The Department of Agricultural Extension will gladly suggest plans for planting school grounds if a diagram showing the size of the premises, the location of the house and other buildings, other trees already on the grounds, and the roads, etc., accompanies the request. There are other points that would help very much in suggesting plans for planting; the kind of soil, level or sloping, forests already on one side or not; location of large stones or very low places, the location of paths generally followed, the direction the building faces, etc.

WHAT SHOUTS FROM THE MOUNTAIN?

W. A. O.



Announcement of Lectures for Teachers' Institutes and Bi-Monthly Meetings.

Instructors.

EDWARD ORTON, Jr., E. M.
"The Mineral Resources of Ohio and Their Possibilities."

J. A. BOWNOCKER, Sc. D.
"Physical Geography."

A. D. COLE, A. M.
"Illustrations of Physical Principles from Every Day Life."
"Home-Made Apparatus for Elementary Science Teaching."

D. R. MAJOR, Ph. D.
"Educational Psychology."
"Psychology of Childhood."

J. E. HAGERTY, Ph. D.
"The School as a Social Institution."
"The Economic Geography of Ohio."

J. R. TAYLOR, A. M.
"The Teaching of English Literature."
"The Uses of Comedy—Reading, 'As You Like It'."

F. L. LANDACRE, A. B.
"Nature Study."

A. H. TUTTLE, A. M.
"United States History and Civics."

T. H. HAINES, Ph. D.
"Psychology for Teachers."

T. K. LEWIS, Sc. B.
"Manual Training in the Public Schools."
"Educational Value of Manual Training."

A. B. GRAHAM,
Superintendent Agricultural Extension.
"Nature Study as a Basis for Elementary Agriculture."
"The Possibilities of the Rural School."

WITH the hope of aiding teachers in their institutes and of increasing the usefulness of the University, the instructors whose names are found above will make engagements any Saturday during the present school year, unless otherwise engaged.

The only expense to institutes will be the traveling expenses of the lecturer.

Address communications to the person desired.